

The claimed subject matter, as recited in independent claim 1, relates to an electrochemical sensor that includes a “solid electrolyte element including at least one first electrode, at least one second electrode and at least one heating element” where the “at least one second electrode [is] *coupled to ground*” and the “at least one first electrode coacting with the at least one second electrode and [is] *negatively polarized*.”

As explained in the “Summary Of The Invention” section of the present application, the claimed subject matter is directed to providing the benefit of effectively blocking a coupling of the heater voltage by grounding the reference electrode. It is also noted that in the context of the claim, if one electrode of the claim is negatively polarized, the other electrode is positive.

The Kato reference purportedly concerns an electrochemical sensor comprising a solid electrolyte element including a first electrode, a second electrode in the reference duct, and a heating element, in which the second electrode is situated closer to the heating element than the first electrode.

To rely on a reference as a basis for rejecting an applicant’s invention, the reference “must either be in the field of applicant’s endeavor” or be “reasonably pertinent to the particular problem with which the inventor was concerned.” *In re Oetiker*, 977 F.2d 1443, 1446 (Fed. Cir. 1992). Thus, to rely on a reference under 35 U.S.C. § 103, it must be analogous prior art. *See* M.P.E.P. § 2141.01(a). To reject a claim based on obviousness, however, there must be some suggestion or motivation to modify a reference or to combine reference teachings in a manner contemplated by the claim, and the prior art references (alone or combined) must teach or suggest all of claim limitations. *See* M.P.E.P. § 2142.

The Final Office Action asserts that although the lower potential element is not specified as ground, it is “conventional in the art” to use ground as the lower potential element. The Final Office Action refers to the Sone, Ohyama, Nakajima and Kojima references that allegedly show the use of ground as a negative potential for a heating element. The Final Office Action further asserts that it would have been “obvious” to use ground as a potential for the second electrode of claim 1, without any support from any of the references.

As regards the Kato reference, this reference refers to an oxygen sensor with a built-in electric heating arrangement, which is intended to be simple in construction and water tight (Kato, column 2, lines 41-47). In contrast, the claimed subject matter is directed to an

electrochemical sensor that addresses the problem of effectively blocking the coupling of the heater voltage by grounding the reference electrode. It is respectfully submitted that any review of the Kato reference makes plain that it is not reasonably pertinent to the problem of effectively blocking any coupling of the heater voltage. Thus, it is respectfully asserted that this reference is non-analogous prior art. prior

It is also respectfully submitted that the references relied upon would not motivate a person having ordinary skill in the art to use ground as a potential for the second electrode, as recited in the context of claim 1, for providing an electrochemical sensor that effectively blocks coupling of the heater voltage by grounding the reference electrode.

The secondary Sone, Ohyama, Nakajima or Kojima references do not cure the critical deficiencies of the primary Kato reference. Regardless of whether Kato, Sone, Ohyama, Nakajima or Kojima may refer to using ground as the negative potential of an automotive battery, as suggested in the Final Office Action, these references (whether taken alone or in combination) simply do not describe or suggest “*at least one second electrode . . . coupled to ground*” as recited in the context of claim 1, for providing an electrochemical sensor that operates to effectively block coupling of the heater voltage.

It is therefore respectfully submitted that the references relied on (whether taken alone or otherwise) do not describe nor suggest the presently claimed subject matter for the reasons discussed above. As such, it is respectfully requested that the obviousness rejection of claim 1 be withdrawn, since claim 1 is allowable.

Since claims 2-12 and 14-20 depend from claim 1, it is respectfully submitted that these claims are allowable for at least the same reasons as claim 1.

Claim 13 includes features analogous to those of claim 1, and it is therefore allowable for at least the same reasons as claim 1.

The Final Office Action also conclusorily asserts that the “first electrode would *inherently* be negatively polarized by induced EMF.” As explained in the Appeal Brief, with regard to the use of the anticipation doctrine of “inherency” in an obviousness rejection, the Board of Patent Appeals & Interferences in *Ex parte Schricker* has stated that:

[O]n the one hand the examiner talks in terms of inherency (which is really an anticipation rationale) while on the other hand the examiner talks in terms that it would have been obvious to experiment to divine optimum conditions.

Inherency and obviousness are somewhat like oil and water -- they do not mix well. Claimed subject matter can be anticipated because a prior art reference describes a method which inherently meets the limitations of a claimed method. Claimed subject matter can be unpatentable for obviousness when, notwithstanding a difference between that subject matter and a prior art reference, the claimed subject matter, as a whole, would have been obvious.

See Ex parte Schricker, 56 U.S.P.Q.2d 1723, 1725 (Bd. Pat. App. & Int. 2000) (obviousness rejections vacated and remanded) (citations omitted; unpublished).

It is therefore respectfully submitted that the Final Office Action wrongly relies on inherency to support an otherwise unsupportable obviousness assertion.

As further regards claim 5, the Final Office Action conclusorily asserts that both Nakajima and Kojima refer to electrodes of the same size, and further asserts that it would have been obvious to a person with ordinary skill in the art to use electrodes of the same size, since the art already recognizes the use of electrodes of equal size. Further, the Final Office Action relies on *In re Rose*, 220 F.2d 459 (C.C.P.A. 1955), to assert that a change in size is generally recognized as being within the level of ordinary skill in the art.

With respect to Nakajima and Kojima, it is believed that these references both refer to oxygen sensors having electrodes situated on opposite sides of a solid electrolyte. The Final Office Action, however, does not indicate in what way the text of these references suggest that the electrodes may be the same size. To reject claims for obviousness, the examiner "must cite the best references at his or her command," and when a reference "shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable." 37 C.F.R. § 1.104(c)(2). Furthermore, the mere possibility that some of the drawings of Nakajima and Kojima may show electrodes that appear to be similar in size (which is not conceded) does not mean that the electrodes of the drawings are the same size. When a reference does not disclose that drawings are to scale and is silent as to dimensions, arguments based on the measurement of the drawing features are of little value. *See Hockerson-Halberstadt, Inc. v. Avia Group Int'l*, 222 F.3d 951, 956 (Fed. Cir. 2000). The Nakajima and Kojima references do not state (or even suggest) that any of the drawings are made to scale or properly dimensioned. It is therefore respectfully

submitted that the possibility that the drawings of Nakajima and Kojima may contain electrodes that appear similar in size cannot form the basis for concluding that these references “set forth the use of electrodes which are all the same size,” as asserted in the Final Office Action.

As to *In Re Rose*, that case concerned a lumber package composed of individual bundles of lumber that varied in length. *In re Rose*, 220 F.2d at 822. The *Rose* Court stated that the weight of the bundles was not “patentably significant since it at most relates to the size of the [lumber].” *Id.* In contrast, claim 5 provides that the second electrode has “approximately the *same surface size* as the at least one first electrode,” which was not arbitrarily chosen, and as expressed in the Specification, increasing the size of the second electrode so that it has “approximately the *same surface size* as the at least one first electrode” provides the benefit of further shielding against any coupling of the heater voltage U_H into the measurement electrode (i.e., the at least one first electrode). (Specification, page 3, lines 7 to 11). It is therefore respectfully submitted that claim 5 is allowable for this further reason.

Claims 2-4 and 21 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Kato reference and the Ohyama, Kojima, Nakajima or Sone references in further view of the Logothetis reference.

It is respectfully submitted that any review of the third-level Logothetis reference makes plain that it simply does not cure the critical deficiencies of the primary or secondary references, and that claims 2 to 4 are therefore allowable for the same reasons as claim 1, as explained above with respect to the Kato reference.

Claim 21 includes features like those of claim 1, and is therefore allowable for essentially the same reasons as claim 1.

Claims 1, 7, 8, 10, 12-15, 19 and 20 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 4,400,260 to Stahl et al. (“the Stahl reference”) in view of the Ohyama, Kojima, Nakajima or Sone references, and as evidenced by the Logothetis reference.

Although Stahl does not specify that the lower potential terminal is connected to ground, the Final Office Action asserts that it would have been obvious to one having ordinary skill in the art to use the “teachings” of Ohyama, Kojima, Nakajima or Stone with the sensor of the Stahl reference. With respect to polarization of the first electrode, the Final

Office Action asserts that if the “oxygen were greater in the measured portion than in the reference passage, the first electrode would be inherently polarized,” and further asserts that the claim does not specify an operating condition where the measured gas concentration is less than the reference gas composition, so that the system of Stahl would (in potentiometric mode) *inherently* meet the polarization limitation “when the measured gas is of a greater concentration than the reference gas.”

First, as regards the obviousness of using ground (as recited in the context of the subject matter as claimed), the secondary Ohyama, Kojima, Nakajima or Stone references in view of the third-level Logothetis reference do not cure the critical deficiencies of the primary Stahl reference for the same reasons as explained above with respect to the Kato reference. Second, it is respectfully believed and submitted that the Final Office Action’s assertion that the system of Stahl would, in potentiometric mode, “*inherently* meet the polarization limitation when the measured gas is of a greater concentration than the reference gas” is not correct.

Claim 1 provides that the first electrode (that is, the one in contact with the measured gas) is the one that is negatively polarized. But in potentiometric mode (that is, when a reverse oxygen pump is not used), the first electrode may be negatively polarized when a measured amount of oxygen *is less than* an amount of oxygen in a reference gas (that is, when the oxygen partial pressure of the measured gas is less than that of the reference gas) -- and not vice versa as suggested by the Final Office Action. The Logothetis reference specifically states that at the “lower oxygen partial pressure side, two oxygen ions combine to give an oxygen molecule to the gas phase leaving four electrons on the . . . electrode,” so that the “net result . . . is the transfer of . . . four electrons from electrode 2 to electrode 1”. (Logothetis, page 137, paragraph 3). Thus, since the electrode on the lower oxygen partial pressure side is the one that receives the four extra electrons and since electrons are negatively charged, the electrode on the measured gas side is the one that is negatively polarized because the measurement gas has a lower oxygen partial pressure.

In short, since the first electrode of claim 1 may not be negatively polarized in potentiometric mode if the measured oxygen concentration is greater than the reference oxygen concentration, the Final Office Action’s assertion that “Stahl would *inherently* meet the polarization limitation when the measured gas is of a greater concentration than the

reference gas" is not correct.

For at least the foregoing reasons, claim 1 is allowable. Since claims 7, 8, 10, 12, 14, 15, 19 and 20 depend from claim 1, it is respectfully asserted that these claims are also allowable for the same or for essentially the same reasons as claim 1.

Since claim 13 includes features analogous to those of claim 1, claim 13 is allowable for essentially the same reasons as claim 1.

Claims 1-14 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,413,683 to Murase et al. ("the Murase reference") in view of the Kato reference.

The Murase reference purportedly concerns an oxygen sensing apparatus for detecting an oxygen concentration of a gas, including a first electrochemical cell having an oxygen-ion conductive solid electrolyte body and a reference and a measuring electrode, for producing an electromotive force corresponding to the oxygen concentration of the gas.

With respect to the first assertion of the Final Office Action, Murase does not disclose coupling a second (reference) electrode to ground, but it instead refers to a reference electrode 24 connected to both a power source 34 across a resistor and an electronic circuit 38. With respect to the second assertion, any review of Murase makes plain that the second electrode of Murase does not communicate with an atmosphere 16 and that it does not read on the specification term "reference duct" for at least the following reasons. First, reference numeral "16" of Murase does not label an "atmosphere", as suggested by the Final Office Action, but it labels a measurement-gas chamber. (See Murase, col. 8, lines 17 to 20). Second, the measurement-gas chamber 16 of Murase is not "situated between the at least one first electrode and the at least one heating element," as is the reference duct of claim 9. Third, the reference electrode 24 of Murase is not "in the reference duct," as provided for by claim 9.

Also, with respect to the third assertion, the term "reference," as used in the claims and as understood with respect to the Specification, is clearly defined. In particular, the terms of a claim are not interpreted in a vacuum, since a pending claim must be "given the broadest reasonable interpretation consistent with the specification." M.P.E.P. § 2111. Thus, the Specification and the claims clearly define the use of the term "reference" as used in the claims. With respect to the fourth assertion, the Final Office Action does not identify a single line of text or a drawing that would indicate that the Murase reference discloses electrodes of similar size. The Office has the initial burden of demonstrating a *prima facie* case of obviousness and, as explained above, in rejecting claims for obviousness, the "examiner must cite the best references at his or her command," and when a reference "shows or describes

inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable.” 37 C.F.R. § 1.104(c)(2).

Therefore, for at least the foregoing reasons, it is respectfully asserted that independent claim 1 and dependent claim 9 are allowable. Further, since claims 2-8 and 10-12 depend from claim 1, it is respectfully submitted that claims 2-8, 10-12 and 13 are allowable for the same or for essentially the same reasons as claim 1.

Since claim 13 includes features analogous to those of claim 1, it is allowable for essentially the same reasons as claim 1.

Claims 15-20 and 22 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Kato and Ohyama, Kojima, Nakajima, or Sone (with or without the teaching of Logothetis) as applied to claims 1 and 21 above, and in further view of Liu et al. (“Oxygen Sensors” from Engineered Materials Handbook, Vol. 4) (“the Liu reference”).

Claim 15 is directed to a “sensor” in which the “solid electrolyte element includes a solid electrolyte tube that is closed on one side.”

The Final Office Action asserts that the Liu reference teaches that oxygen sensors can be conventionally constructed using a tubular configuration. It further asserts that it would have been obvious to one of ordinary skill in the art to use the teachings of the Liu reference for the sensors of Kato and Murase because the art recognized that tubular elements are an alternative form of sensor construction and because substituting one known way of constructing a sensor for another (when the results are not unexpected) requires only routine skill in the art.

The references used to support an obviousness rejection must be analogous prior art. *In re Oetiker*, 977 F.2d at 1446. As stated above as to claim 1, the Kato reference, as well as the secondary Ohyama, Kojima, Nakajima, and Sone references are non-analogous art. As such, it is respectfully submitted that claims 15-20 and 22 are allowable for at least the same reasons as their respective base, independent claims 1 and 21, as explained above.

As regards the secondary Liu reference, it is believed that any review of that reference makes plain that it concerns operational aspects of oxygen sensors (*see* Liu, page 1131, column 1, first paragraph), and that the Liu reference is non-analogous art and therefore cannot be used to support an obviousness rejection. Thus, it is respectfully submitted that claims 15-20 and 22 are allowable.

Claims 15-17, 19 and 20 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Murase in view of Kato as applied to claim 1 above, and further in view of the Liu reference.

For the reasons discussed previously, it is respectfully submitted that claims 15-17, 19 and 20 are allowable for essentially the same reasons claim 1 is allowable, since the secondary Liu reference does not cure the critical deficiencies of the primary references.

In short, all of claims 1 to 22 are allowable.

CONCLUSION

Since claims 1 to 22 are allowable, prompt reconsideration, withdrawal of the rejections, and allowance of the present application are therefore respectfully requested.

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